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Nutraceutical and medicinal values of minor fruits in Western Ghats of South India

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Abstract

India figured with two hotspots the Western Ghats and the Eastern Himalayas. Western Ghats are one of the centers with huge minor and underutilized edible fruit plant diversity. One of the great gifts of nature to mankind is fruit. A Good number of minor fruit crops are considered as medicinal plants in respect to its curative properties. They should be eaten in adequate quantity; regular consumption fruit reduces obesity malignance health increase the longevity of life. In recent years, there is considerable awareness about the delicious, medicinal value, nutritional security, food safety and used as a local diet. There is an immense scope and potentiality for exploiting the minor fruits for poverty alleviation and nutritional security particularly in the Western Ghats of south India. Aonla is high content of tannin i.e. gallotanic acid, which on hydrolysis yields gallic acid. Jamun fruits are used as an effective medicine against diabetes, heart, spleen, liver trouble, cancer, and inflammatory diseases. The bael fruit is very effective to cure dysentery, diarrhoea, restorative, laxative and good for heart and brain. Kokum juice exhibits anti-scorbutic, anthelmintic and cardiotoxic properties.

Keywords: Western Ghats, Nutraceuticals, medicinal plants, minor fruits, gallic acid

Introduction

India figured with two hotspots the Western Ghats and the Eastern Himalayas. Western ghats are one of the centers with huge minor and underutilized edible fruit plant diversity. One of the great gifts of nature to mankind is fruit. Fruits play predominant role in the diet. Several healths based statistical reports highlight the importance of consumption of fruits as they tend to contain broad-spectrum essential nutrients including phenolic antioxidants that impart protective role against several diseases. Minor fruits are consumable to the human beings but relatively less Palatable than other fruits, which have lesser demand in the market, which are grown to a limited extent only. Other terms that are used for these fruits are less – known fruits, less appealing fruits, less-exploited fruits, stray fruits, wild fruits etc. The western ghats are the rich biodiversity on many minor and underutilized edible fruits species viz, Amla, Bael, Jamun, Pomegranate Jack fruit, Bread fruit, Carambola, Phalsa, Karonda, Passion fruit, Mangosteen, Rambotan, Wood apple, Durion, malayn, apple roseapple, langsat, egg fruit, westindian cherry, elephantfoot apple, mulberry, Karonda, Kokum, Fig, Ramphal, Tamarind Lime, lemon, Mandarin and annona and wild edible fruits- Aporosa, Artocarpus/wildJack, Berberis, Buchanania/charoli, Elaeagnus, Garcinia gummi-gutta, Syzygium, Opuntia, Lantana, Ixora, Hulagada hannu, Haale hannu, Chotte hannu etc. Abhishek *et al.*, 2017)^[17]. These fruits have both restorative as well as curative properties viz. aromatic, cooling, digestive, stomachic, stimulant, astringent, emollient, useful in seasoning, maturation and fermentation of culinary, processed food and drinks. There are few other fruits which possess specific properties such as diuretic, diaphoretic, sedative or stimulant to nerves, improver of peristaltic movements of intestine and liver ailment, cardio tonic, relieving cough, cold, bronchitis, asthmatic spasm, blood pressure etc. Some minor fruits contain essential oils in their peel, foliage or roots and exhibit carminative and germicidal properties. In addition to their therapeutical values, these fruits provide nutrition, strength and vigour to our body and restore loss of minerals and amino acids, thus protecting it against many deficiencies and diseases. Some of the other minor fruits found in the regions are fairly good source of ascorbic acid viz.

Artocarpus spp. Bael, wood apple and amla were found to be rich source of calcium (Singh *et al.*, 2003; Mazumdar, 2004; Abhishek *et al.*, 2017) [26, 23, 17]. Western Ghats, one among eight hottest hot-spots of biodiversity in world harbor many minor fruits which are edible and unfamiliar to large proportion of the global population and one of the centers with remarkable fruit diversity (Roach, 2005) [29]. According to Vietmeyer (1990), about 2000 species have edible fruits and are found in Western Ghats of Maharashtra, Karnataka, Kerala, Goa and also some parts of North Eastern states found in evergreen and semi-evergreen forests. (Krishnamurthy, 2011) [20].

India as the great tradition in fruit. We offer one or the other fruits in worshipping Gods and in festivals. In honouring elders, eminent personalities, silver bowl full of fruits are must. Patients after surgery are normally advised to consume fruits for fast recovery. Fruits play an important role in treating several diseases. They are useful in curing nutrient deficiency diseases. There are several examples available in Ayurvedic literature about the role of different fruits in human diet. The fruits are also the part of health foods. They are the food products supplemented with herbal ingredients, vitamins, minerals and nutrients. They are now popularly known as "Nutraceuticals", the word first coined in 1996 by Stephen De Felice. These are defined as parts of a food or a whole food that have a medicinal or health benefit including prevention and treatment of disease. These are bridge the gap between food and medicines. Besides basic nutritional value, they provide health and medicinal benefits. Excessive free radical concentration in the body cause damage to DNA, proteins & natural defense enzymes and may cause health problems. Nutraceuticals exhibit antioxidant activity and act as scavengers of free radicals (OH, OOH, OOR, Singlet oxygen) that damage our body. (DeFelice, 1996) [7]. The medicinal value is subordinated to the nutraceutical value and certain minor fruits might have medicinal qualities, one of the possible functions of nutrients being also the therapeutic one. There is also an important ethno-botanical tradition of the folk medicine from all the countries that have kept from old times the knowledge about the healing features of fruits, picked up from nature or cultivated (Edonia, 2001, Anupam, 2013 Ghosh, 2017) [8, 3, 11]. The globe nutraceutical market is rising at an annual growth rate of 8.5 per cent and has reached estimated US \$ 12.8 billion in 2016. In India the two major diseases that are causing alarming concerns are the cardiovascular diseases and diabetes (Farid, 2017) [9].

Minor and underutilized wild edible fruits of Western Ghats

The present article describes some of the important minor and edible fruits of the Western Ghats, particularly in Southern India.

Aonla or Amla (*Emblica officinalis* Gaertn)

It is also called as 'Goose berry, The Ayurvedic wonder'. The fruit of amla is the treasure house of medicinal properties. No other fruit can stand in comparison with amla as a source of medicinal properties. Fruits are highly nutritious as it contains carbohydrates, fiber and minerals like calcium, prosperous, iron, vitamin C and vitamin B complex. Medicinal properties: Antiscorbutic (cures scurvy), diuretic, laxative, antibiotic and anti-dysenteric. The fruits contain proteins, ascorbic acid and higher concentrations of most minerals and amino acids. Glutamic acid, proline, aspartic acid, alanine and lysine are

the important amino acids present in amla fruits. It is profusely used in the process of complete rejuvenation of the body. It prevents grey hair, hair falling, is anti-aging, and purifies blood. It is very useful in constipation.

It has recorded evidences of increasing eyesight and aphrodisiac effects. It also helps in digestion of food. It is astringent in taste and cause cooling effect on the body. The fruit is acrid, cooling refrigerant, diuretic and laxative. The dried fruit is useful in hoemaahage, diarrhea and dysentery. They are anabolic, anti bacterial and resistance building. They possess expectorant, cardio tonic, anti-pyretic, anti oxidative, antiviral and anti emetic activities. They are also used in the treatment of leucorrhoea and arterosclerosis. It is highly useful in treating respiratory problems like, asthma, bronchitis, tuberculosis, etc. It is very useful in diabetes, skin diseases, diarrhea, piles, pain, white discharges, bleeding disorders, kidney problem and cataract. It is the main ingredient of the ayurvedic preparation 'Chyavanprasha' and one of the three ingredients of 'Thiphala choorna', (mixture of Amla, *Terminalia chebula* and *T. bellerica*) *Brahma Rasayana* and *Madumegha churna* which is a health and digestion tonic, which also prevents hair from premature graying and falling.

Even amla flowers have laxative properties. Amla juice along with bitter gourd juice taken daily stimulates the pancreas to produce more insulin. Similarly, a mixture of amla powder, jamun seed powder and bitter gourd powder taken daily for best results. Dried amla mixed with jiggery is a very effective cure for rheumatism. Phylloemblin, obtained from fruit pulp has been found to have mild depressant action on central nervous system and good liver tonic Farooqi, 2015) [10]. Water in which dried amla is soaked makes a soothing lotion for eyes, while amla juice with honey is useful in preserving eye sight, curing glaucoma and conjunctivitis. Regular dose of the juice improves eyesight and good for eye muscles. Therefore, 'an amla -a-day keeps the doctor away' (L.N Hegade, 2005) [16].

Bael (*Aegle marmelos*)

The Bael tree is considered as a sacred tree by the Hindus. They offer its leaves to Lord Shiva during worship. The bael fruits are the major source of medicinal properties and it can be branded as Nature's Most Natural Medicinal Fruit. The mature fruits are astringent, digestive and stomachic are usually prescribed for diarrhea and dysentery. The ripe fruits are tonic, restorative, laxative and good for heart and brain. Methanolic extract of leaves showed very good anti - bacterial property. The medicinal value of Bael fruit is enhanced due to presence of Tanin, the evaporating substance in its rind. The rind contains 20% and the pulp has only 9% of Tanin. This substance helps to cure diabetes. Ripe fruit is taken during summer to keep the body and mind cool. Bael also helps to sharpen intellect and concentration of mind.

Several home remedies can be prepared from the fruits

For Stomach disorders: Bacterial dysentery, diarrhea and bleeding. About 6g dried and powdered matured fruit pulp thrice daily will be helpful. Pulp with sugar for dysentery. For amoebic dysentery, Diarrhoea and rickets, six g fruit pulp in 120 ml water, sweetened with sugar will be helpful. For vomiting of pregnant women few dosed of a decoction of a decoction of bael root, vetiver and roasted rice powder is useful.

For Piles: Regular dose of a decoction of bael root & ‘ambashta’ (*Cyclea paltata*) with jiggery/ a decoction of powdered, unripe fruit, ginger methi (fenugreek) is effective.

For healing of Wound: Take rind, root, leaves, fruit pulp of equal quantity. Grind them to extract juice. Add 10 gms. of honey. Drink it.

For diarrhoea: The dried pulp if consumed quickly, stops loose motion.

For jaundice: Extract juice of 100 nos. of soft bael leaves. Mix it with the powder of 10 Nos. of black pepper. Take the mixture every morning and evening. Added to this take at least five glasses of sugarcane juice daily after meals.

For poison: Poison caused by sting of insects and animals can be treated by taking ‘vilvadi’ tablet (bael) ground in tulsi leaf juice. A poultice of bael bark on the wound also nullifies poison and helps healing.

For dropsy: Powdered pepper in bael leaf juice is effective to treat dropsy accompanied by jaundice and constipation.

For heart disease: A decoction of bael bark alleviates some type of heart diseases. The decoction of bael root, castor root and ashwagandha root with rock salt also heals heart diseases.

For swollen Joints: Few bael pulp mixed with hot mustard oil to be applied on the affected area twice a day during morning and evening for relief.

For healthy Mind and Brain: Ripe bael fruit taken with fresh cream (butter) and sugar candy powder sharpens concentration and intelligence. **As brain tonic:** Tender leaf juice of bael taken daily helps in brighten intelligence and memory.

For treatment of Asthma: Grind 5 gms. of Bael leaves. Add 1 spoon of honey. Take orally in morning and evening for relief.

For ulcers: To heal ulcers on the chest by placing a poultice of bael pulp taken from fully ripe fruit.

For hair care: Frequent application of a paste of bael leaves on the head, half an hour before bath heals dandruff and premature hair fall.

For fever and cough: Bael root decoction mixed with bael powder cures fever and cough.

For Typhoid: Our body becomes weak due to high fever. Grind 200 bael leaves. Boil in one cup of water till it becomes thick. Take this paste with a little honey twice or thrice a day.

For Troubles during Pregnancy: One spoon of raw fruit pulp if taken twice a day stops frequent vomiting nausea during pregnancy. Little sugar may be added to the pulp for taste.

For common cold: Leaf infusion of diluted bael leaf, as normal infusion is helpful in curing common cold.

For liver disorders: Daily eating of a fresh bael leaves heals

liver disorders and lowers high blood pressure.

As tonic for new mothers: Decoction of bael root and ‘bal root’ (*Sida rhombifolia*) with coconut oil, ghee and cane jiggery for 12 days acts as body tonic for lactating mothers.

For intestinal worms: About 250-500g bael fruit pulp taken daily for a week helps in removing intestinal worms. Except Bael seeds everything is useful for consuming. Taking 5-6 leaves regularly keeps the body and mind healthy. Because of its medicinal qualities it cures a lot of ailments. That is why Bael is also known as Mahaphala or Great fruit.

Cure of Anaemia: Extract the pulp of Bael. Dry it and grind it to powder form. Add one spoonful of this powder to boiled cowmilk. Also add some sugar candy. Take this dose twice a day in morning and evening for a long period Saswati, 2004, Faruki, 2004, lakshminarayana Hegade, 2005 Promod, 2017)^[16]

Jamun (*Syzygium cumini*)

The refreshing and curative properties of jamun make it one of the useful medicinal plants of India. Fruits are good source of iron. Jamun fruits are used as an effective medicine against diabetes, heart and liver trouble. The powder of seeds has high value being useful in the treatment of diabetes. Therefore, the jamun fruits are having high value in terms of therapeutic and nutrition. Antioxidant activity of Jamun is due to anthocyanins, gallic acid, quercetin etc. Juice is diuretic and prevents enlargement of spleen. The fruit extract prevents oxidation of LDL, control; prevent atherosclerosis, cancer, and cardiovascular/ inflammatory diseases. Seed powder used as diabetic medicine Consumption of fresh fruits purifies blood, avoids bad breath, Strengthens gum and teeth. Gargling of fruit juice cures throat pain. The fruits are good for phlegm, constipation and piles. The fruit juice sherbet is very effective against diarrhoea and dysentery. It is also good for diabetes. Fruit should be eaten after two hours of meal. It is good for liver; in turn it controls the blood sugar in the body. Consumption of fruits improves digestion and prevents tiredness. Seed powder is classified under fiber food items, which reduces the glucose level in the blood. The delay in glucose absorption caused by fiber content is beneficial for individual with diabetics, because glucose is released more slowly in to the blood stream. The study of supplementation of jamun seed powder @ 2g. daily for three months, found reduced blood sugar level to 30mg per 100ml of blood Hegade, 2005 Gayathri *et al.*, 2012; Shilpa and Krishnakumar, 2015)^[16, 12, 33].

Passion fruit (*Passiflora incarnate*)

The pulp is rich in vitamin A and C and beta – carotene. It has fair amounts of Na, Mg S and chlorides. The fruit is recommended as a medicine for anxiety and insomnia. It has been used as a mild sedative since ancient times. The medicinal uses of the plant started during the 19th century in the US. It was used as a cure for nervous restlessness and gastro-intestinal spasm. Now, it is widely approved that passion fruit juice could reduce anxiety due to mental tension, bring relaxation and induce sleep. Flavonoids are responsible for these effects.

Pomegranate (*Punica granatum L.*)

The Pomegranate was a logo of 18th World Agri Congress of 1970. It is a juicy fruit, which is available in every region of

the country. This nutritious fruit is of three types, the sour, sweet and sweet- sour type. The sour type is grown widely in our country. This has the acidic effect and helps to bring down phlegm. Those who have acidity should take this in small quantity.

The sweet type has several medicinal properties. It is mild laxative. The fruit helps to sharpen one's memory power. It has a toning effect on the skin and is used in the preparation of skin tonics. It aids in digestion and is good for heart patients. Its iron and pectin contents are considerable. It enriches haemoglobin content in the blood. People suffering from piles will benefit from Pomegranates. The sweet juice makes the bones grow firm in children. In northeastern regions, the juice is even used to knead flour. This provides strength without inducing fat in the body. It is rich in phosphorous, calcium, and iron. The rind of the fruit is useful for children. For loose motion, two spoons of rind paste in juice extract with jiggery will control the dysentery. Fruit juice is tonic for intestine and the liver. For eye irritation and common eye pain, Pomegranate leaf paste will provide relief when applied on eyelids. Hair oil prepared from fruit juice (1kg), leaf paste (100g) in mustard oil massaging the hair gives healthy growth of hair. Rind powder is the main constituent of ayurvedic preparations 'Dadimastaka choorna' and 'bhaskara lavana choorna'.

Jackfruit (*Artocarpus heterophyllus* Lamk.)

It is one of the largest fruits in nature. It is a very familiar fruit among Indians. It is wholesome and highly nutritious fruit. The consumption of the fruit will cure a variety of nutritional deficiency disorders. It is considered as 'the jack of all fruits'. This often underrated fruit which when ripe, makes its presence felt in no uncertain terms to our noses, is considered to have, along with the avocado and the olive, the healthiest mix of nutrients for human dietary needs, having almost the exact nutritional equivalents of mother's milk. Rich in vitamins, A, B and C, potassium, calcium, iron, proteins. The high levels of carbohydrates in it makes the jackfruit a cheap, easily available supplement for other staple foods like rice. As the fruit flakes are difficult to digest, the people with poor digestibility have to avoid this fruit. Owing to its numerous culinary uses and its availability in plenty during the heavy monsoon rains, it has earned the well-deserved name 'Poor man's food'.

Medicinal Uses: The Chinese consider jackfruit pulp and seeds tonic, cooling and nutritious, and to be "useful in overcoming the influence of alcohol on the system." The seed starch is given to relieve biliousness and the roasted seeds are regarded as aphrodisiac. The ash of jackfruit leaves, burned with corn and coconut shells, is used alone or mixed with coconut oil to heal ulcers. Mixed with vinegar, the latex promotes healing of abscesses, snakebite and glandular swellings. The root is a remedy for skin diseases and asthma. An extract of the root is taken in cases of fever and diarrhea. Sarala and Krishnamurthy, 2014)^[30].

Avocado/Butter fruit (*Persea Americana* Mill.)

Fruits are consumed primarily as fresh. They are neither sweet nor acidic. It is reputed as a nourishing food of high dietic value. Its nutritional values are comparable to ripe olives. Since the fruits contain less than one per cent sugar, it is recommended as high-energy food for diabetics. Its energy value is twice as much as banana fruit. The avocado oil is used in preparation of cosmetics Mazumdar, 2004)^[23].

Carambola (*Averhoa carambola* L.)

Various plant parts are credited with medicinal properties. E.g. root extract is used as an antidote for poisoning and the crushed leaves for curing chicken pox, ringworm and scabies Farooqi, 2015)^[10].

Fig (*Ficus carica* L.)

It is another highly nutritious fruit. It is rich in calories (269 IU), protein, calcium (higher than milk), iron and highest fiber content. Fig has nutritive index 11 as against 9, 8, 6 of apple, raisin and dates, respectively. Total sugar content of fresh fig is 16 per cent and of dried is 52 per cent. It is valued for its laxative properties and is used in the treatment of skin infections. Fruits help to maintain acid- alkali balance of the body Mazumdar, 2004)^[23].

Karanda (*Carissa carandas* L.)

The fruits are richest source of iron, containing good amount of vitamin C. They are very useful to cure anemia. Its fruits have antiscorbutic properties also.

Phalsa (*Grewia subininaequalis*)

Ripe fruits are sub-acidic in taste and a rich source of vitamins A and C. They are also rich in phosphorous, and iron. Its medicinal qualities are known since Vedic times. Its fruits are somewhat astringent and have cooling effect. They help to cure inflammation, heart and blood disorders, fever and constipation Mazumdar, 2004)^[23].

Garcinia indica (Thouars) Choisy. a tree commonly found along the coastal area of the Western Ghats. *Garcinia* comprises several potential bioactive constituents, majority proportions of them being garcinol and hydroxycitric acid (HCA). The pulp of the fruit is acidic that tastes sour. Generally, the rind of the fruit is commercially exploited as it is considered to be potentially therapeutic; it is used as souring agent in most of south Indian coastal cuisines. Moreover, the butter extracted from rind finds application in nutraceutical and cosmetic industries. Furthermore, is used to prepare several kinds of beverages and functional foods (Baliga *et al.*, 2011; Swami *et al.*, 2014; Jagtap *et al.*, 2015)^[5].

Garcinia gummi-gutta (L.) Roxb. is widely distributed along the lower altitude of Western Ghats (coastal region). Fruit juice exhibits anti-scorbutic, anthelmintic and cardiotoxic properties. Moreover, fruit rind and seeds are potential source of bioactive compounds such as lipids, fatty acids and nutraceuticals. The fruit is commercially exploited for its weight loss properties (Naveen and Krishnakumar, 2013 and; Mahesh *et al.*, 2016)^[28, 22].

Opuntia dillenii (Ker Gawl.) Haw. Is native to Central America and widely distributed in the Western Ghats. Pulp is utilized to make into syrup, jam or jelly, a rich source of betalins (Kalegowda *et al.*, 2015; Pooja and Vidyasagar, 2016)^[25].

Conclusions

The minor fruits are reservoirs of several essential nutrient elements, vitamins and minerals and bioactive compounds are directly attributed to antioxidant properties against various free radicals. Anti-nutritional factors have to be evaluated before their utilization and consumption. It is believed that regular consumption of these fruits will aid in preventing several diseases and disorders including obesity, diabetes and chronic diseases. They have a greater potential to cure several deficiency disorders and also increase the immunity against

diseases. So that more awareness is created among the consumers, which will subsequently benefit to fight several nutrition related problems. Therefore, it is probably apt to call them as 'medicinal fruits' instead of nearly neglected 'minor fruits'.

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